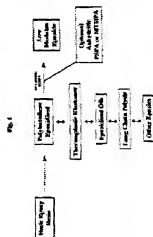


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1	233	((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus	USPAT	2003/05/13 09:51
2	2391	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4	USPAT	2003/05/13 09:51
3	4888	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 09:54
4	499	((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 09:54
5	18	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4 and (((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus)	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 09:54
6	69503	((metal\$3 adj foil) (metal\$3 adj (film layer)) with (adhesive adhesion glue))	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:06
7	7	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4 and (((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus)) and ((metal\$3 adj foil) (metal\$3 adj (film layer)) with (adhesive adhesion glue))	USPAT	2003/05/13 09:57
8	7	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4 and (((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus)) and ((metal\$3 adj foil) (metal\$3 adj (film layer)) with (adhesive adhesion glue))) and (metal\$3 foil film layer adhesive adhesion glue)	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:22
9	0	10/008049	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:21
10	0	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4 and (((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus)) and ((metal\$3 adj foil) (metal\$3 adj (film layer)) with (adhesive adhesion glue))) and (metal\$3 foil film layer adhesive adhesion glue)) and encapsu	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:23
11	0	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4 and (((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus)) and ((metal\$3 adj foil) (metal\$3 adj (film layer)) with (adhesive adhesion glue))) and (metal\$3 foil film layer adhesive adhesion glue)) and polymeriz	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:24
12	4	((metal\$3 adj foil) (metal\$3 adj (film layer))) with packag\$4 and (((metal\$3 adj foil) (metal\$3 adj (film layer))) with modulus)) and ((metal\$3 adj foil) (metal\$3 adj (film layer)) with (adhesive adhesion glue))) and (metal\$3 foil film layer adhesive adhesion glue)) and molding	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:48
13	365	modulus with polymerized	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:49
14	72	modulus near4 polymerized	USPAT; US-PGPUB; EPO, JPO, DERWENT; IBM_TDB	2003/05/13 10:49

15	46	modulus near3 polymerized	USPAT; US-PGPUB; EPO, JPO; DERWENT; IBM_TDB	2003/05/13 10:49
16	26	modulus near2 polymerized	USPAT; US-PGPUB; EPO, JPO; DERWENT; IBM_TDB	2003/05/13 10:49
-	12	(foil with modulus) same (die chip '1C')	USPAT; US-PGPUB; EPO, JPO; DERWENT; IBM_TDB	2003/01/15 10:14
-	22102	metal adj foil	USPAT	2003/05/13 09:43
-	2193	(metal adj foil) with adhesive	USPAT	2003/01/13 16:36
-	2226	(metal adj foil) with (adhesive glue)	USPAT	2003/01/13 16:37
-	7	((metal adj foil) with (adhesive glue)) with modulus	USPAT	2003/01/13 16:37
-	1	"5880935".PN.	USPAT	2003/01/13 16:56
-	1	"5637382".PN.	USPAT	2003/01/13 16:57
-	1	("5899720").PN.	USPAT	2003/01/15 10:16
-	1	("5888888").PN.	USPAT	2003/01/15 10:17
-	1	("5818092").PN.	USPAT	2003/01/15 10:18
-	1	("5728625").PN.	USPAT	2003/01/15 10:18
-	1	("5563100").PN.	USPAT	2003/01/15 10:18

51 2514-948



[0018] A UV curable composition comprising a UV curable epoxy-functional essentially solvent free reactant, and a UV curing agent, said composition, subsequent to cure, exhibiting a modulus of less than about 50,000 psi, and an elongation of greater than about 3.0%.

[0019] In process form, the present invention describes a process for providing a low modulus underfill encapsulant which comprises the steps of mixing from 1 to 99 parts of a UV curable epoxy-functional essentially solvent free reactant with 99 to 1 parts of a component selected from the group consisting of epoxidized polybutadienes, thermoplastic elastomers, epoxidized oils, long chain polyols, other epoxy monomers/oligomers, and mixtures thereof, followed by addition of a UV curing agent and applying the mixture to a substrate to provide a coated substrate and exposing said coated substrate to light of wavelength from about 100 to 700 nm wherein the mixture is substantially polymerized by exposure to said light, and said polymerized mixture has a modulus of less than about 50,000 psi and an elongation of greater than about 3.0%.

[0020] In still further embodiment, the present invention also relates to a low moduli thermoset encapsulant which comprises an epoxy based thermoset resin

	U	I	Document ID	Issue Date	Pages	Title
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 20010014399 A1	20010816	8	CONDUCTIVE UV-CURABLE EPOXY FORMULATIONS
4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	US 6294249 B1	20010925	19	Packaged pre-adhesive comp

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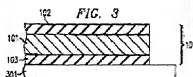
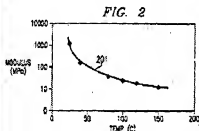
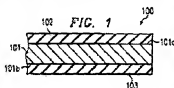
(103) In a preferred embodiment, the adhesive is a pressure sensitive adhesive at 25.degree. C. In another preferred embodiment, a hot melt coated mixture of the adhesive and the packaging material is a pressure sensitive adhesive at 25.degree. C. and has a storage modulus when measured in torsional shear at 25.degree. C. and at 1 radian/second of between about 10.sup.4 and about 10.sup.7 dynes/cm.sup.2.

(104) The polymerized adhesives of the invention preferably have a storage modulus (G') when measured in torsional shear at 25.degree. C. and at 1 second (or frequency of 1 radian/second) between about 10.sup.4 and 10.sup.8 dynes/cm.sup.2 and more preferably between about 10.sup.4 and 10.sup.7 dynes/cm.sup.2. The storage modulus for a polymerized adhesive having a composition of 90 parts isooctyl acrylate and 10 parts acrylic acid is 1.58.times.10.sup.6 dynes/cm.sup.2 and for an adhesive having a composition of 98 parts isooctyl acrylate and 2 parts acrylic acid is 2.times.10.sup.5 dynes/cm.sup.2 as determined by means of a Dynamic Thermal Mechanical Analyzer (DTMA) made by Polymer Laboratories. The instrument subjects the sample to small sinusoidal oscillation in a shear geometry. The shear storage modulus is measured at a frequency of oscillation of 0.1 to 100 Hertz over a temperature range of -100.degree. C. to 150.degree. C. at a heating rate of 2.degree. C. per minute according to ASTM No. D4065-82.

(105) The polymerized adhesives may be used to make a coatable thermoplastic or thermosettable hot melt adhesive by introducing the adhesive and its

	U	1	Document ID	Issue Date	Pages	Title
4	<input type="checkbox"/>	<input type="checkbox"/>	US 6294249 B1	20010925	19	Packaged pre-adhesive comp
5	<input type="checkbox"/>	<input type="checkbox"/>	US 6022585 A	20000208	7	Method of coating an optical

US Application Publication May 15, 2003 Sheet 1 of 5 US 2003/0092215



DETAILED DESCRIPTION:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] FIG. 1 is a schematic cross section of the multilayer composite attachment film, generally designated 100, for use in assembling a semiconductor chip onto a substrate. The metal foil 101 has first and second surfaces, designated 101a and 101b, respectively. An adhesive layer 102 is attached to surface 101a, and another adhesive layer 103 is attached on surface 101b. For the application of the present invention, the modulus of the chip attach material should be high enough to improve fatigue life of the solder joints of the chip-scale device. Specifically, the materials of metal foil 101 and adhesive layers 102 and 103 have to be selected so that the multilayer composite has an average modulus greater than the modulus of the polymerized encapsulation material employed to complete the assembly of the chip-scale semiconductor device. For molded packages fabricated with a filler-enriched epoxy molding compound, the modulus of the encapsulation material is approximately 20 to 26 GPa.

[0027] A preferred choice for metal foil 101 is copper in the thickness range

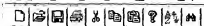
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Title
used chip attach for
semiconductor pack

20-26 GPa

20,000 MPa

5×10^4 Pa



Active

- ❖ L10: (234) 9 and modulus
- ❖ L11: (98) 10 and polymeriz\$4
- ❖ L12: (66) 11 and elastic\$5
- ❖ L13: (49) 12 and (die chip 'IC' packag\$3)
- ❖ L16: (2484) (metal adj foil) with (adhesive glue)
- ❖ L17: (121) 16 and (modulus with elastic\$4)
- ❖ L9: (2228) (metal adj foil) with (adhesive glue)
- ❖ L18: (13) 17 and (polymeriz\$4 with material)
- ❖ L19: (98) 16 and (encapsulat\$3 with material)
- ❖ L20: (10) (polymeriz\$4 adj encapsulat\$3) with material
- ❖ L23: (4) 22 and (encapsulat\$4 with material)
- ❖ L22: (104) 9 and (modulus with elastic\$5)
- ❖ L26: (10981) foil with (adhesive glue)
- ❖ L27: (640) 26 and ((polymeriz\$4 encapsulat\$3) with material)
- ❖ L28: (40) 27 and (modulus with elastic\$5)
- ❖ L29: (32) 16 and (foil with modulus)
- ❖ L30: (4) ((metal adj foil) with adhesive) with (modulus with elastic\$4)

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DBs USPAT; US-PGPUB Plurals

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((metal adj foil) with adhesive) with
(modulus with elastic\$4)

BRS IS&R Image Text

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	U	I	Document ID	Issue Date	Pages	Title	Current OR	Current
1	<input type="checkbox"/>	<input type="checkbox"/>	US 6451441 B1	20020917	11	Film with metal foil	428/461	428/457; 428/463
2	<input type="checkbox"/>	<input type="checkbox"/>	US 6376769 B1	20020423	38	High-density electronic package, and method for making same	174/52.2	174/260; 257/685;
3	<input type="checkbox"/>	<input type="checkbox"/>	US 6274225 B1	20010814	14	Circuit member and circuit board	428/209	174/254;



Pending

Active

- L10: (234) 9 and modulus
- L11: (98) 10 and polymeriz\$4
- L12: (66) 11 and elastic\$5
- L13: (49) 12 and (die chip 'IC' packag\$3)
- L16: (2484) (metal adj foil) with (adhesive glue)
- L17: (121) 16 and (modulus with elastic\$4)
- L9: (2228) (metal adj foil) with (adhesive glue)**
- L18: (13) 17 and (polymeriz\$4 with material)
- L19: (98) 16 and (encapsulat\$3 with material)
- L20: (10) (polymeriz\$4 adj encapsulat\$3) with material
- L23: (4) 22 and (encapsulat\$4 with material)
- L22: (104) 9 and (modulus with elastic\$5)
- L26: (10981) foil with (adhesive glue)
- L27: (640) 26 and ((polymeriz\$4 encapsulat\$3) with material)
- L28: (40) 27 and (modulus with elastic\$5)

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Search

List

(metal adj foil) with (adhesive glue)

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<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 6505069 B2	20030107	9	Electrochemically reactive cathodes for an electrotransport device	604/20	29/527.5; 29/527.7;
<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 6504444 B1	20030107	7	High frequency integrated circuit	333/1.1	333/219.1;